

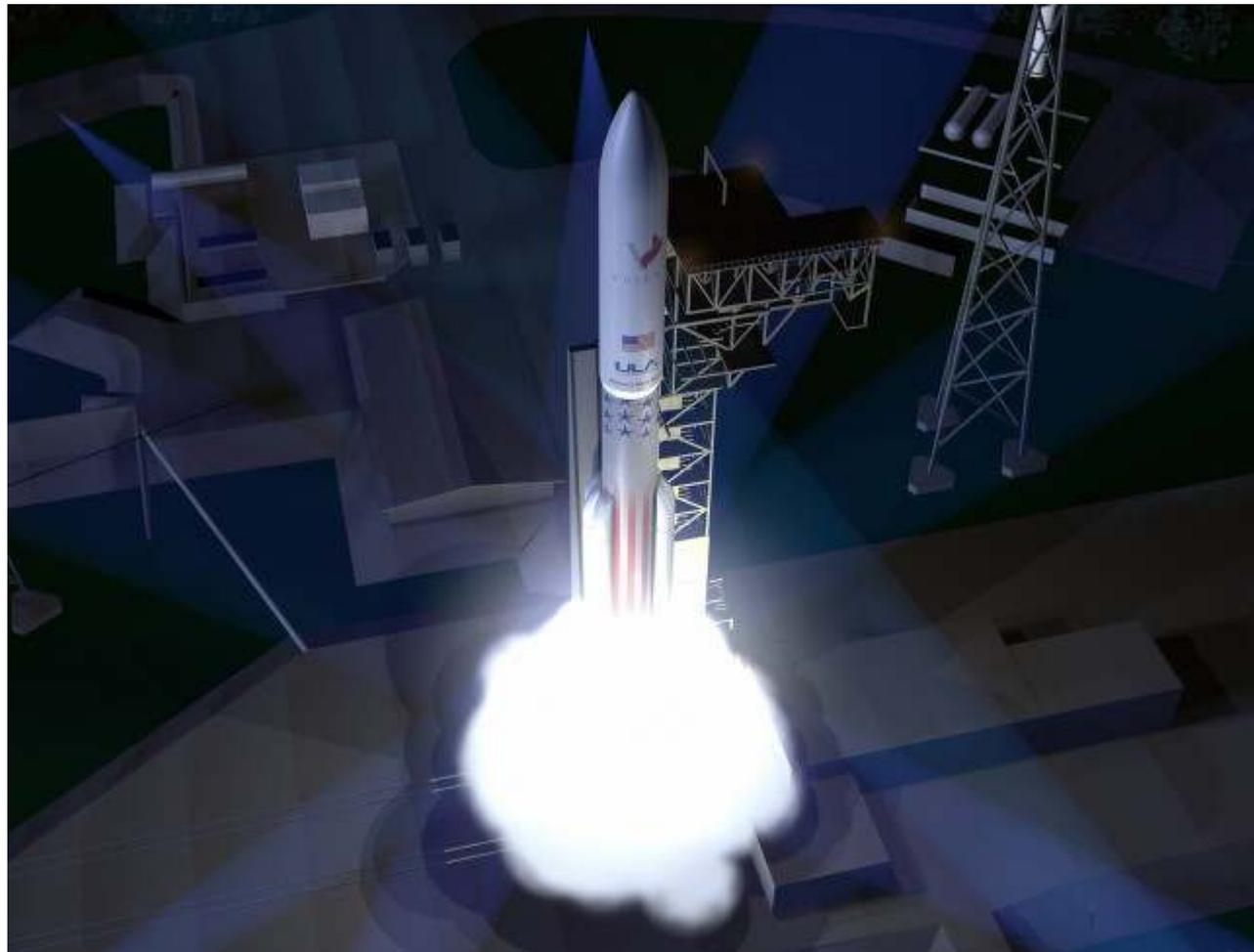


TIROS SPACE INFORMATION NEWS BULLETIN

Vol. 40 No.8, May 2014
Editor: Jos Heyman FBIS

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Vulcan

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The *Tiros Space Information (TSI) - News Bulletin* is published to promote the scientific exploration and commercial application of space through the dissemination of current news and historical facts. In doing so, Tiros Space Information continues the traditions of the Western Australian Branch of the Astronautical Society of Australia (1973-1975) and the Astronautical Society of Western Australia (ASWA) (1975-2006).

The News Bulletin can be received worldwide by e-mail subscription only. Subscriptions can be requested by sending an e-mail address to tirosspace@hotmail.com. Tiros Space Information reserves the right to refuse any subscription request without the need to provide a reason.

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Calling card...

One reader commented on the recent discussion on the Kosmos-2000 to 2500 satellites and regretted that he – being a young student who only recently became interested in astronautics – did not have access to the discussion that covered the Kosmos satellites up to 2000. As promised when I started this current Kosmos discussion, I have sent him the necessary information.

Spurred by that request I have included a summary listing of **all** types of Kosmos satellites up to 2500 in this News Bulletin.

and

With the launch of Soyuz TMA-16M, with Kelly and Kornienko commencing on a one year mission in space, one press report read:

Hundreds of kilometres below on Earth, their governments are locked in a standoff over Ukraine - but up in space, Russian cosmonauts and American astronauts are still working together side by side. The International Space Station (ISS) is one of the rare areas of US-Russian cooperation that has not been hit by the Ukraine crisis and in the latest show of commitment, the next joint mission.

Of course one does not have to be an Einstein to realise why this cooperation continues – both the USA and Russia need each other on this outpost in space be it for different reasons.

All we can hope for is that this cooperation copies itself at surface level and brings an end to all this sabre rattling, shirt fronting, one upmanship or whatever you like to call it.

Jos Heyman

RLV



India intends to perform the initial flight test of its Reusable Launch Vehicle (RLV) technology demonstrator sometime in June 2015. Conceived in 2009 as a first step toward a fully reusable, two-stage-to-orbit launcher, the flight will be the first in a series of four experimental flights. With a mass of 1500 kg, the demonstrator will be launched to an altitude of 70 km with a solid fuelled rocket after which it will descend by gliding and splashing down in the sea. The flight will demonstrate the vehicle's hypersonic aerodynamic properties, avionics, thermal protection and control systems, as well as mission management.

PROCYON

The PROCYON interplanetary spacecraft that was launched on 3 December 2014 as a secondary payload to the Hayabusa-2 mission, has now been directed on a fly-by with asteroid 2000DP107. This is a binary system consisting of an 800 m primary asteroid and a 300 m secondary asteroid. Their separation is 2.6 km.

At launch PROCYON did not have an assigned target and the first five months in orbit were used to complete the primary objectives of demonstrating deep space communications and attitude control using the ion engine on the spacecraft. Unfortunately the ion engine developed some problems which may prevent the asteroid fly-by. If these problems are resolved the spacecraft will make an Earth fly-by on 3 December 2015 after which it will be directed to the asteroid system for a fly-by on 12 May 2016 during which it will conduct observations using a camera with a scan mirror and on-board image feedback control.

Satellite Update

Launches in March 2015

Int.Des.	Name	Launch date	Launch vehicle	Country	Notes
2015 010A	ABS-3A	2-Mar-2015	Falcon 9 v.1.1	Hong K	Communications
2015 010B	Eutelsat 115 West-B	2-Mar-2015	Falcon 9 v.1.1	Eutelsat	Communications
1998 067FQ	Flock 1b-21	2-Mar-2015	ISS	USA	Earth observation
1998 067FR	Flock 1b-22	2-Mar-2015	ISS	USA	Earth observation
1998 067FS	Flock 1b-10	2-Mar-2015	ISS	USA	Earth observation
1998 067FT	Flock 1b-09	2-Mar-2015	ISS	USA	Earth observation
1998 067FU	Flock 1d'-1	3-Mar-2015	ISS	USA	Earth observation
1998 067FV	Flock 1d'-2	3-Mar-2015	ISS	USA	Earth observation
1998 067FW	Flock 1b-05	3-Mar-2015	ISS	USA	Earth observation
1998 067FX	Flock 1b-06	3-Mar-2015	ISS	USA	Earth observation
1998 067FY	TechEdSat-4	4-Mar-2015	ISS	USA	Technology
1998 067FZ	GEARRSAT	4-Mar-2015	ISS	USA	Technology
1998 067GA	MicroMAS	4-Mar-2015	ISS	USA	Technology
1998 067GB	Lambdasat	4-Mar-2015	ISS	USA	Technology
1998 067GC	Flock 1b-11	5-Mar-2015	ISS	USA	Earth observation
1998 067GD	Flock 1b-12	5-Mar-2015	ISS	USA	Earth observation
2015 011A	MMS-1	13-Mar-2015	Atlas V-421	USA	Scientific
2015 011B	MMS-2	13-Mar-2015	Atlas V-421	USA	Scientific
2015 011C	MMS-3	13-Mar-2015	Atlas V-421	USA	Scientific
2015 011D	MMS-4	13-Mar-2015	Atlas V-421	USA	Scientific
2015 012A	Ekspress AM-7	18-Mar-2015	Proton M/Briz M	Russia	Communications
2015 013A	Navstar 2F-9	25-Mar-2015	Delta 4M+(4,2)	USA	Navigational
2015 014A	Arirang-3A	25-Mar-2015	Dnepr 1	S Korea	Earth observation
2015 015A	ISG Optical-5	26-Mar-2015	H 2A-202	Japan	Earth observation
2015 016A	Soyuz TMA-16M	27-Mar-2015	Soyuz FG	Russia	Crewed; docked with ISS
2015 017A	Galileo FOC-3	27-Mar-2015	Soyuz 2-1b/Fregat MT	ESA	Navigational
2015 017B	Galileo FOC-4	27-Mar-2015	Soyuz 2-1b/Fregat MT	ESA	Navigational
2015 018A	IRNSS-1D	30-Mar-2015	PSLV	India	Navigational
2015 019A	Beidou 3I-1S	30-Mar-2015	CZ 3C/YZ 1	China	Navigational
2015 020A	Gonets M-11	31-Mar-2015	Rokot/Briz KM	Russia	Communications
2015 020B	Gonets M-12	31-Mar-2015	Rokot/Briz KM	Russia	Communications
2015 020C	Gonets M-13	31-Mar-2015	Rokot/Briz KM	Russia	Communications
2015 020D	Kosmos-2504	31-Mar-2015	Rokot/Briz KM	Russia	Technology

Other updates

Int. Des.	Name	Notes
1998 067EU	Flock 1b-24	Re-entered 15 March 2015
1998 067EV	Flock 1b-23	Re-entered 4 March 2015
1998 067FB	Flock 1b-02	Re-entered 14 March 2015
1998 067FC	Flock 1b-08	Re-entered 5 March 2015
1998 067FF	Flock 1b-17	Re-entered 4 March 2015

2013 064H	ORS tech-1	Re-entered 23 March 2015
2013 064J	SENSE-1	Re-entered 21 March 2015
2014 057A	Soyuz TMA-14M	Undocked on 11 March 2015 and re-entered on 12 March 2015

Beatles in Space (MMS)

The four MMS satellites placed in orbit on 13 March 2015, have been nicknamed John, Paul, George and Ringo.

Delta 2

There are now three Delta 2 launch vehicles left of which one is scheduled to launch JPSS-1 in 2017 and another to launch ICESat-2 in 2017.

The third one has not been allocated to any mission and it does not look like there will be a payload. Instead it may be kept at the factory to serve as a spare parts supplier for the other two launch vehicles and, whatever will be left over, may be donated to the Smithsonian for display at the National Air and Space Museum.

FeatherCraft and Kaber

The US subsidiary of Surrey Satellite Technology has proposed the FeatherCraft space platform for satellites with a mass of up to 45 kg to be deployed from ISS. The spacecraft will have an electric propulsion system provided by Aerojet Rocketdyne, allowing it to raise the orbits as high up as 500 km, thereby increasing its orbital lifespan.

The satellites will be deployed on ISS with the use of the Kaber deployer that has been developed by NanoRacks and can accommodate payloads of up to 100 kg. The Kaber deployer will be shipped to ISS later this year.

The base cost for a FeatherCraft platform, including the launch, is estimated at US\$ 6 million.

CubaSat-1

The Superior Institute of Technologies and Applied Sciences (InSTEC) and of the Polytechnic Superior Institute José Antonio Echeverría (Cujae), Havana, Cuba, will start with the construction of the CubaSat-1 cubesat. The main objective of the CubaSat-1 is to develop the necessary capacities in Cuba of satellite technology, through the design, analysis, assembling, integration, proving, launching and operation in orbit of a cubesat.

Beidou phase 3 and YZ 1

On 30 March 2015 a CZ 3C/YZ 1 launch vehicle placed the Beidou 3I-1 navigational satellite in orbit.

It was the first satellite in the third phase of China's navigational satellite constellation.

This phase, also referred to as Compass I, uses three slightly different satellites:

- Beidou 3M, comprising 27 satellites placed in a medium Earth orbit;
- Beidou 3I, comprising three satellites with a mass of 4200 kg in inclined geosynchronous orbits; and
- Beidou 3G, five 4600 kg satellites in geostationary orbit.

Based on the DFH 3B bus the satellites carry a phased array antenna for navigation signals, a laser retroreflector and two deployable dish antennas.



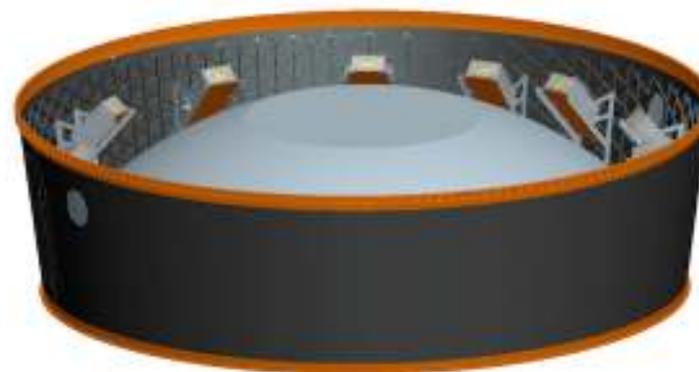
Beidou 3 constellation

This was also the first flight of the Yuanzheng (YZ) 1 upper stage designed to conduct direct orbital insertions into a variety of orbits. The liquid fuelled engine of the YZ 1 has a thrust of 6.5 kN and is capable of making multiple burns. A larger version, known as YZ 2, is being developed for the CZ 5 rocket.

SLS EM-1

The first flight of the SLS launch vehicle, designated Exploration Mission (EM)-1 and scheduled for November 2018, will now carry eleven cubesats as secondary payloads.

The primary objective of EM-1 is to send an uncrewed Orion spacecraft around the Moon and serve as a proving ground for the integrated Orion spacecraft and SLS, allowing designers to move forward with development of the vehicle and prove the systems' ability to carry and deploy experiments.



The eleven cubesats will be placed inside the upper stage adapter where they will be exposed once the Orion spacecraft has been released. 10 minutes after the launch. When the Orion is at a safe distance, the cubesats will be deployed.

So far five cubesats have been selected for the flight: Near-Earth Asteroid (NEA) Scout, Lunar Flashlight, BioSentinel, Lunar IceCube and Skyfire.

Europa Clipper

NASA has invited the European Space Agency to contribute a lander or ice penetrating probe for the Europa Clipper mission. It is expected that ESA will make a decision later this year.

The Europa Clipper mission, described in the March 2015 issue, will be launched in the mid-2020s and, after a journey to Jupiter, will conduct 45 flybys of the Jovian moon Europa.

Spy satellites?

Oleg Maidanovich, the commander of the Russian Space Command, the division of the military responsible for warning of missile and air strikes and controlling Russia's defence satellites, recently suggested that there are a number of 'enemy spy satellites' which have been disguised as space junk. It is claimed that this is a group of space satellites for radio-technical reconnaissance of equipment on Russian territory.

Cancelled Projects: Lunar A

by Jos Heyman



Lunar-A was a Japanese mission to the Moon that was first proposed in the early 1990s. The main objective of the mission was to image the surface of the Moon, monitor moonquakes, measure the near-surface thermal properties and heat flux and study the lunar core and interior structure.

For this the 500 kg spacecraft would be fitted with a monochromatic imaging camera with a resolution of 50, as well as two 75 cm long and 14 cm diameter penetrators.

The spacecraft was to be launched around 1997 with a M-5 launch vehicle from Kagoshima. Problems with the thrusters of the penetrators caused delays and a revised launch date on August 2004 could not be met either. In addition the M 5 programme was terminated in 2006 whilst the main spacecraft, built ten years earlier, had fallen into disrepair and would have required too much money to fix it. The project was cancelled in January 1997.

After launch the spacecraft would have been placed in a low-earth orbit from where, after a few orbits, it would be sent into a translunar trajectory. On reaching the Moon it would have been placed in a 40 km orbit with an inclination of 30°. From this altitude the two penetrators would have been released following which the orbiter would have climbed back to a 200 km altitude orbit.

The penetrators were to be aimed at locations on opposite sides of the Moon, After their release they would have been slowed down by a brake rocket at an altitude of about 25 km. From there on they would free fall towards the surface, impacting at a speed of 330 m/sec, driving them 1 to 3 m into the surface of the Moon.

The penetrators were to be equipped with seismometers and devices to measure heat flow. The seismometers was to monitor moonquake activity for about a year. The heat flow measurements would have provide information on the thermal state and evolution of the Moon.

Data collected by the penetrators would have been transmitted to the orbiting spacecraft that, at the same time, was mapping the surface with its camera system.

Whilst the Lunar A mission was cancelled, the penetrators were further developed and were to be flown on the Russian Luna-Glob mission which was then scheduled for launch in 2010. But test data indicated that the seismic equipment onboard penetrators would not survive at the impact speed of 2500 m/second that the Luna-Glob mission was expected to reach. NPO Lavochkin attempted to reduce the speed by developing a solid-propellant systems that would have slowed them down, indicating that the problem that delayed the Lunar A mission had not yet been resolved, It was, however, felt that this posed a high risk to the success of the mission and sometime before 2010 it was decided to abandon the penetrators for the Luna Glob mission, which is now scheduled for 2018.

X-37B/OTV-4

The next flight of the Orbital Test vehicle (OTV) or X-37B mini-spaceplane, is scheduled to be launched from Cape Canaveral on 6 May 2015.

The launch will use an Atlas V and has also been given the name Air Force Space Command (AFSPC)-5.

This time, instead of landing at Vandenberg, the flight will land at Cape Canaveral, using the Kennedy Space Center Space Shuttle runway.

ISS and Russia

Contrary to the report in last month's News Bulletin that Russia was going to withdraw from ISS in 2024, it has now been announced that Russia would like to build a new space station in cooperation with the USA and the other ISS partners. The statement was made at the recent launch of Soyuz TM-16M in the presence of NASA's Administrator Charles Bolden. Russia also indicated it would like the participation of countries not currently involved in ISS. Subsequently NASA indicated there were no firm plans to work together on a successor space station.

PeruSat-1

Peru's 450 kg PeruSat-1 high resolution optical reconnaissance satellite will be launched by means of a Vega launch vehicle early in 2016.

The satellite will be owned by the Peru Ministry of Defence and is being built by Airbus Defence and Space.

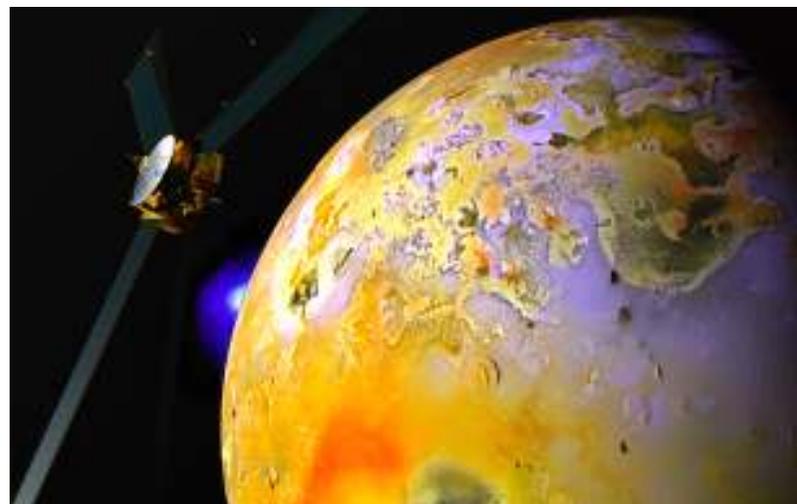
Kosmos summary table

The following table shows the sub-type as well as the first satellite and last satellite of the sub-type along with the number of satellites in the sub-type.

Type	First	Last	#	Type	First	Last	#
Kosmos/Scientific	1	2494	48	Tsikada	883	2230	21
Zenit 2	4	344	74	Zenit 4MKM	927	1214	38
DS-P1-I	6	919	21	TKS Module Test	929	1443	3
Venera	21	482	6	Yantar 2K	1028	1471	22
Zenit 4	22	355	72	Meteor 2	1045		1
DS-P1-Yu	36	850	72	Okean	1076	1869	6
Strela 1	38	90	26	Resurs F	1127	1990	40
Molniya 1	41	1423	4	Yug	1146	2332	14
Meteorological test	44	226	10	Molniya 3	1175	1305	2
Voskhod Test	47	110	3	Siluet	1246	1865	7
Luna	60	395	5	Yantar 4K2	1298	1511	87
DS-U2-V	93	202	4	Musson	1312	1803	8
US-A	102	1932	35	Potek	1366	2371	10
Strela 2	103	2298	52	Bor-4 tests	1374	1669	5
Soyuz Test	133	672	13	Glionass	1413	2417	95
OGCh	139	433	15	Yantar 4KS1	1426	2113	13
Zond	146	154	2	Resurs O	1484	1939	3
Kosmos/Technology	149	2499	16	Prognoz	1546	2440	11
Tsiklon	158	1027	28	Zenit 8	1571	2281	100
ASAT	185	1379	39	Tselina 2	1603	2428	21
Tselina O	189	1345	40	Meteor 3	1612		1
Sfera	203	1067	17	Strela 3	1617	2467	133
Zenit 2M	208	1090	92	Foton	1645	1841	3
Zenit 4M	251	667	57	Luch	1700	2054	3
Zenit 4MK	317	920	78	Ekran M	1817		1
Strela 1M	336	2194	360	Almaz	1870		1
Crewed Lunar Test	379	434	4	Kometa	1896	2415	13
Tselina D	389	2242	71	Geo IK	1950	2470	5
Mars	419		1	Etallon	1989	2024	2
Zenit 4MT	470	1398	23	Don	2031	2423	8
Oko	520	2479	91	Neman	2153	2370	9
Salyut	557	1686	2	Gonets	2199	2201	2
Bion	605	2229	10	Obzor	2285		1
Vektor	660	2292	24	Yenisey	2290	2372	2
Soyuz T Test	670	1074	5	Nadezhda	2315		1
Yantar	697	1218	9	Arkon	2344	2392	2
US-P	699	2421	50	Glionass M	2382	2500	37
Parus	700	2463	98	Yantar 4KS2	2410	2495	9
Resurs T	741	2260	6	Rodnik	2416	2498	13
Zenit 4MKT	771	1681	26	Persona	2441	2486	2
Taifun 2	816	2306	30	Lotus S	2455		1
Molniya 2	837	853	2	Glionass K	2471		1
Zenit 6	867	1573	94	Garpun	2473		1
TKS VA	881	1101	6	Kondor E	2487		1

New interplanetary spacecraft proposals

NASA has received 28 proposal for the next interplanetary mission in the Discovery programme. The proposals are very varied but the details of a number of them have not been disclosed. The competition stipulated that nuclear propulsions was not allowed and many of the proposals use all-electric propulsion systems. It is expected that two will be chosen for further development in August 2015 with a final decision sometime in 2016.



IVO

The University of Arizona has submitted a proposal for a mission to the volcanic Jovian moon Io. If successful the Io Volcano Observer (IVO) could be launched in May 2021, enter into an orbit around Jupiter in February 2026 and perform at least nine flybys of Io whilst observing the active volcanoes. The spacecraft would carry a suite of cameras, heat detectors and spectrometers that would collect 900 times more data on Io than the Galileo orbiter obtained during its eight-year tour around Jupiter.

Cornell University proposed the Enceladus Life Finder (ELF) that would fly ten times through plumes of water launched above the south pole of Saturn's icy moon Enceladus. These jets of water are expected to carry salts and organic molecules from an underground ocean. The instruments would measure amino acids, the building blocks of proteins, and analyze fatty acids, as well as determine whether methane found in the plumes could have been produced by organisms.

A proposal by the Arizona State University intends to send a spacecraft to Psyche, a nearly 240 km asteroid that is believed to be the leftover metallic core of a protoplanet from the ancient solar system. The spacecraft would need five years to fly towards an encounter with the asteroid and would then spend a year orbiting the asteroid.

The Goddard Space Flight Center proposed the Dark Asteroid Rendezvous (DARe) mission, to be launched in May 2021 to orbit at least two asteroids, although these asteroids have not yet been named.

Asteroids is also the subject of the University of Colorado and Jet Propulsion Laboratory's Binary Asteroid in-situ Explorer (BASIX) mission that would be launched in December 2020 and reach its target, asteroid 1996 FG3, in May 2024. Once there the spacecraft will drop explosive pods to detonate on the asteroid and gauge the surface's strength and cohesion.

The Comet Radar Explorer (CORE), proposed by Arizona State University, would be launched in July 2021 and rendezvous with comet Tempel 1 in late 2026. Using radar it will probe the comet's internal structure and map it with a color camera and thermal imager.

The Phobos and Deimos Origin Assessment (PANDORA) mission, proposed by the Planetary Science Institute in Arizona, would undertake a four year survey of the Martian moons, dipping close to each moon's cratered surface to obtain high resolution imagery and measure their composition. To be launched in June 2020 the spacecraft would cruise to Mars over a period of two years before beginning a four year survey of the moons.

The Mars-Moons Exploration, Reconnaissance and Landed Investigation (MERLIN) mission proposed by the Johns Hopkins University, would land on Phobos in October 2024 for a 90-day mission to explore the moon's origins, testing a hypothesis that the body initially formed in the outer solar system and somehow made it to Mars. Launch would be in 2021 and would include several fly-bys of the moon Deimos. The lander would also be able to take off again from the Phobos surface and fly to a different location on that moon.



PADME

A proposal by the NASA Ames Research Center, named Photos and Deimos and Mars Environment (PADME) would depart Earth in August 2020, attain an orbit around Mars in

February 2021 and then fly past Phobos sixteen times and Deimos nine times over a one-year primary mission. It would collect data that would help to resolve the origins of the two moons. Once the Mars mission is complete, PADME could be used for an experiment with deep space laser communications and repurpose the spacecraft to escape the red planet's gravitational grasp and head for an asteroid flyby.

The Jet Propulsion Laboratory proposed the Venus Emissivity, Radio Science, InSAR Topography and Spectroscopy (VERITAS) that would survey Venus with X-band radar from an orbit of 220 km altitude.

The University of Colorado proposed the Venus Atmosphere and Surface Explorer (VASE), a spacecraft that would take a four-month journey to Venus and deploy a large balloon in the planet's upper atmosphere. The balloon would circumnavigate the planet twice, collecting its own measurements 55 km above the planet while relaying data from a deep entry probe designed to obtain a vertical profile of Venus's sweltering atmosphere. The probe would plunge into the Venusian atmosphere on a 90 minutes journey whereas the balloon would remain in operation for a period of two weeks.

NanoSwarm is a University of California Santa Cruz proposal for a swarm of more than 30 cubesats around the Moon to observe its interaction with the solar wind, study strange localized magnetic swirls, and track the movement of water across the airless lunar surface. If accepted it could be launched in February 2020 for a 10 months mission.

The Near-Earth Object Camera (NEOCam), a proposal by the Jet Propulsion Laboratory, envisages a spacecraft at the L1 libration point from where an infrared detector will locate approximately two-thirds of the large asteroids that could eventually impact our planet, expanding the growing catalog of nearby objects deemed potentially hazardous to Earth.

The Arizona State University proposed the Kuiper astronomical telescope to be located at the L2 Lagrange point from where it would observe the solar system's gas giants, moons like Europa, Io, Ganymede and Callisto, and distant smaller objects as far away as Pluto, over a period of three years. The telescope would be about half the size of the Hubble Space Telescope and would begin operations at a point in time that NASA expects to end the Hubble mission.

NewSat

The prospective Australian communications satellite operator NewSat is bankrupt. The company has been put in the hands of administrators who will protect the company's assets so that it may either survive after restructuring or, alternatively, the best financial return is obtained for the creditors.

NewSat currently operates with transponders on Measat-3b which was launched on 11 September 2014. These transponders have been identified as Jabiru-2.

Jabiru-1 is to be the first fully owned NewSat satellite and is being built by Lockheed Martin using the A2100AXS platform. It is to be launched in 2016.

Further in the future NewSat intends to launch Jabiru-3, -4 and -5 whilst the company operates ground stations in Perth and Adelaide.

ISSpresso



Coffee is now on at the International Space Station!

Lavazza and Argotec, in cooperation with the Italian Space Agency, have developed a coffee machine for use in ISS. It was sent up to the space station on board of the Dragon CRS-6 flight.

Known as ISSpresso, it is a capsule-based espresso system that has been specifically built to be able to operate in the microgravity conditions aboard ISS.

OzQube-1



At the recent Launching Cubesats For and From Australia seminar in Adelaide, West Australian Stuart McAndrew gave a presentation on OzQube-1, Australia's first PocketQube. Stuart labels himself as an Amateur Spacecraft Builder and is not affiliated to a university or a similar organization. In fact, his OzQube-1 is being built in his shed at his suburban home in Perth. . OzQube-1 is an Earth observing PocketQube satellite, designed to take images of Australia, and other southern hemisphere targets. The images will be stored on-board, and then transmitted via amateur radio frequencies to interested people on the ground. The images can be received using basic, low-cost hardware. Stuart expects his satellite to be ready towards the end of the year. He is looking for sponsors to get his satellite launched.

Vulcan



United Launch Alliance (ULA) has unveiled its new launch vehicle. Previously referred to as the Next Generation Launch System (NGLS), it has been named Vulcan,

ULA is a joint venture by Boeing and Lockheed Martin and is responsible for all the Delta 4 and Atlas 5 flights that take place. The Vulcan will gradually replace these two launch vehicles, commencing with a planned 2019 first flight.

The core or first stage of the Vulcan will be powered by either two Blue Origin BE-4 liquefied natural gas main engines or two Aerojet Rocketdyne AR-1 kerosene powerplants, depending on a choice to be made next year. These new rocket engines will be a welcome replacement for the current Russian built RD-180 engines that power the Atlas 5.

Like the Atlas 5 and Delta 4 launch vehicles, the use of different nose cones and up to six strap-on boosters, will allow the Vulcan to be optimised for a specific payload requirement, thereby servicing the full spectrum of launch requirements.

The launch cost of the Vulcan is expected to reduce from the current \$164 million for an Atlas 5 launch, to \$100 million for the basic Vulcan.

ULA plans to replace the current Centaur upper stage with a new upper stage by 2023. Known as the Advanced Cryogenic Evolved Stage (ACES) this stage will be powerful enough to place the heaviest satellites directly into a geostationary orbit.

Further down the track, in 2024, ULA hopes to introduce the recovery of the first stage engines through the Sensible Modular Autonomous Return Technology process in which the two first stage engines would separate from the tank after burn-out and then deploy an inflatable heat shield to slow their re-entry. Next steerable parachutes would be deployed which would slow their descent for mid-air recovery by a helicopter. The engines would then be re-certified and used again.

ULA employees proposed Eagle, Freedom, GalaxyOne, Vulcan, and Zeus as the five possible names for the launch vehicle but the ultimate selection was the result of a public naming competition.

Tsyklon 4 and Alcantara

For about ten years Brazil and Ukraine have been working on a project to establish a launch pad at Brazil's Alcantara site from which the Ukrainian Tsyklon 4 could be launched to compete in a commercial market.

The Tsyklon 4 launch vehicle was being developed from the Tsyklon 3, which flew for the last time on 24 December 2004. The first of three stages was to be powered by an RD-261 engine and was to have RD-855 vernier engines producing a total thrust of 3,032,000 N. The second stage was to use the RD-262 engine with RD-856 vernier engines giving it a total thrust of 941,000 N. The final stage was to have an RD-861K engine and was to feature a larger payload bay. All stages were to be fuelled by N2O4/UDMH.

Using Alcantara as a launch site, this would have allowed the launch of commercial satellites with a mass of up to 5700 kg into low-Earth orbit and 1600 kg into a geostationary transfer orbit. Initially it was thought that launches could have commenced in 2006 but, over time, this was stretched to February 2012. Further delays occurred in Ukraine, with the construction of the launch vehicle, as well as Brazil, with the construction of the launch site, and a first launch was further advanced to 2014. By the end of 2013, with the first Tsyklon 4 only 80% completed and the launch site halfway to completion, a 2015 first launch was envisioned.



Proposed Alcantara launch site

The conflict between Ukraine and Russia that began in 2014 had an effect on the availability of the engines and by early 2015 work on the launch vehicle had stopped. At about the same time Brazil stopped all work at the uncompleted Alcantara site and it is likely the entire project has been abandoned.

This has had an impact on the Belgian Von Karman Institute that had booked a Tsklon 4 flight for the launch of the 50 two-unit cubesats for the QB50 project. The Institute is now looking for another launch opportunity.

Vostochny

It is expected that the first launch from the Vostochny launch site will take place in December 2015. Construction of the launch site was begun in 2012. Located in the far eastern Amur region of Russia, the launch site will reduce Russia's use of Baikonur in Kazakhstan. Baikonur is on lease to Russia until 2050.

Falcon 9 recovery attempt #2



The first stage of the Falcon 9 launch vehicle that placed the Dragon CRS-6 spacecraft in orbit on 14 April 2015, was intended to land back onto a barge in the Atlantic Ocean. The attempt had an estimated success rate of 50%.

After separation from the upper stage two of the nine Merlin 1D engines of the first stage fired briefly for the 'boostback' and 'entry' maneuvers required to get the stage to the landing platform floating in the ocean about 350 km from the Florida coast.

Close towards the actual landing, the center engine ignited to slow down the rocket's descent in the final seconds before touchdown. But in these final moments the first stage did not settle straight down due to a faulty throttle valve and instead landed with lateral motion, following which it toppled over and exploded.

This was the second attempt to recover the first stage. The previous attempt was on 10 January 2015 when the stage also crashed.

Another attempt will probably be made on the next Dragon launch scheduled for June 2015.